Chemical Reactions and Equations

- In a chemical reaction, at least one of the following will occur:
  - Change in state
  - Change in colour
  - Evolution of a gas
  - Change in temperature

- **Balanced chemical equation**
  Reactants $\rightarrow$ Products
  LHS $\rightarrow$ RHS
  Total number of atoms on the LHS = Total number of atoms on the RHS

  - **How to balance an equation**
    - Write reactants and products
    - Balance the max. number of a particular atom on both sides
    - Balance other atoms
    - A complete balanced equation should look like

  \[
  \text{CO}_2(\text{g}) + 2\text{H}_2(\text{g}) \xrightarrow{340 \text{ atm}} \text{CH}_3\text{OH}(\text{l})
  \]

- **Types of reactions**

  - **Combination reaction**
    - Two or more reactants combine to form one single product.
    - **Examples**
      \[
      \text{CaO}(\text{s}) + \text{H}_2\text{O}(\text{l}) \rightarrow \text{Ca(OH)}_2(\text{aq})
      \]
      \[
      \text{Ca(OH)}_2 \rightarrow \text{Slaked lime }
      \]
      \[
      \text{C} + \text{O}_2 \rightarrow \text{CO}_2
      \]
      \[
      2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}(\text{l})
      \]

  - **Exothermic reaction** – Heat gets released in the reaction. Most combination reactions are exothermic. For example,
    \[
    \text{CaO(s)} + \text{H}_2\text{O(l)} \rightarrow \text{Ca(OH)}_2(\text{aq})
    \]
    Calcium oxide Water Calcium hydroxide
    (Quick lime) (Slaked lime)

  - **Endothermic reaction** – Heat is absorbed in the reaction. Very few combination reactions are endothermic. For example,
    \[
    \frac{1}{2}\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{NO}_2(\text{g})
    \]